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(54) Pivot connection for slip joint pliers

(57) A rivet has a shank with a preformed head 10 at one end overlapping one of the plier halves 1 to be connected, and the other end of the shank 11 is headed (at 17) over the other plier half 2 and is expanded into a hole in the other plier half 2 which is tapered outwardly (at 16) at a locking taper angle, the plier half 2 being thereby firmly fixed to the rivet.

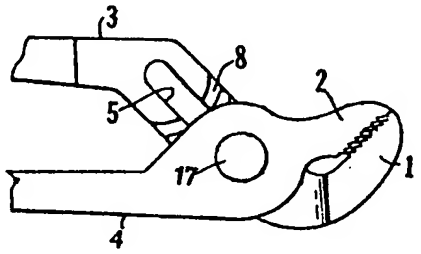

FIG. 2

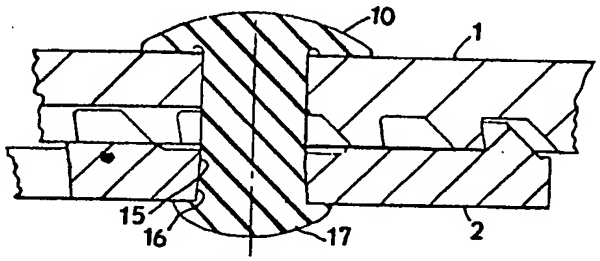

FIG.6

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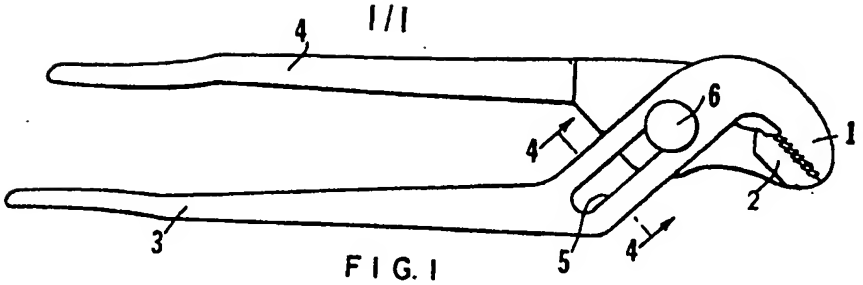

FIG. 1

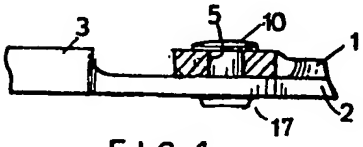

FIG. 4

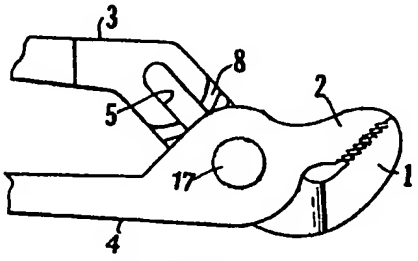

FIG. 2

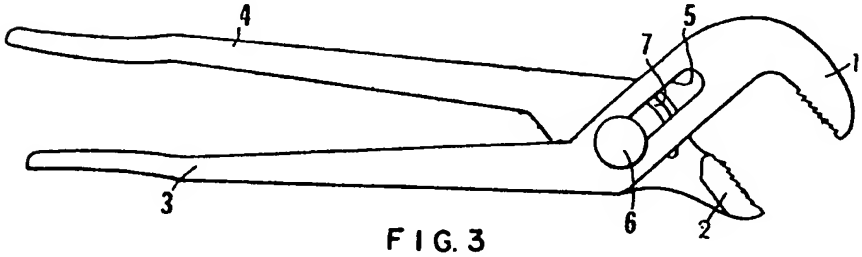

FIG. 3

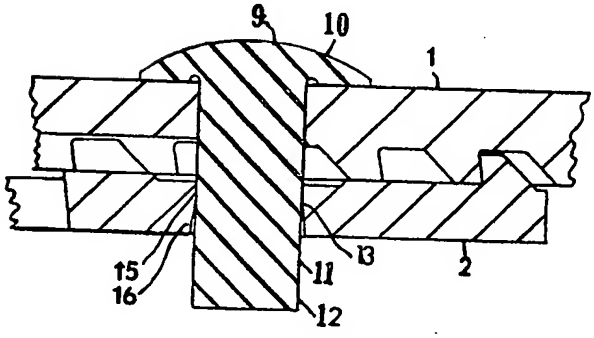

FIG.5

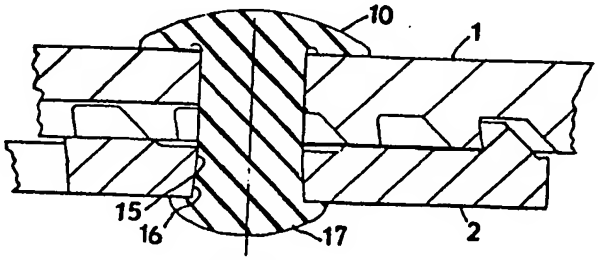

FIG.6

SPECIFICATION

Pivot connection for slip joint pliers and the like

This invention relates to a pivot connection for slip joint pliers and the like.

The object of the invention is to provide a pivot connection for slip joint pliers which is stronger than the nut and bolt connection now in use.

Pursuant hereto, the invention provides slip joint pliers comprising first and second members each having a handle connecting to a mating jaw; the jaw of the first member being formed with a slot and with grooves on its inside so that a plurality of pivot positions are defined along its length. The jaw of the second member being formed with a circular hole coaxial with an outwardly facing circular locking taper, and with a rib extending outwardly from its inside surface and being adapted to be positioned in any selected one of the grooved pivot positions for adjusting the opening between the mating jaws and a sliding pivot type fastener connecting the mating jaws together, said fastener comprising a rivet having a head and a shank, the head overlapping the slot in the jaw of the first member, and a portion of the shank extending through the slot and being slidable back and forth along the slot, the remaining portion of the shank extending through the circular hole and the circular locking taper and projecting beyond the second member, the end of said remaining portion which projects beyond the second member being formed with a head over the second member and with an expanded tapered portion which fits tightly into the said locking taper and the circular hole so as to form a permanently set non-rotatable joint and sliding pivot fastener.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a top plan view of a slip joint pliers with the jaws in the fully closed position;

Figure 2 is a bottom plan view of the Figure 1 pliers

Figure 3 is a top plan view of the Figure 1 pliers with the jaws in the maximum open position;

Figure 4 is a section on line 4 - 4 of Figure 1;

Figure 5 is an enlarged section through the pivot connection before the rivet is headed; and

Figure 6 is a similar enlarged section after the rivet is headed.

The invention is applied to slip joint pliers, so-called because the plier jaws may be moved to several positions to vary the width of the grip of the jaws. In the particular pliers illustrated, which are of the tongue and groove type, mating jaws 1 and 2 respectively are carried by handles 3 and 4. In other words, a first member consists of the jaw 1 and the handle 3 and a second member consists of the jaw 2 and the handle 4. The jaw 1 has an elongated slot 5 for a pivot 6. Successive pivot positions are established by moving the pivot 6 along the slot 5. In each position, a rib 7 on the jaw 2 is received in a groove 8 in the jaw 1. The radius of curvature of the rib 7 and the grooves 8 is substantially the same, and each is centred on the pivot pin 6, so that in each position the jaws may be pivoted to open and close the grip. This and other types of slip joint pliers are well known in the art, and need not be further described or illustrated.

Heretofore the pivot 6 for the slip joint pliers has been a nut and bolt. Under some stress conditions, the nut and bolt connection breaks.

To increase the strength of the pivot connection, there is substituted for the nut and bolt a rivet 9 having a head 10 corresponding to the head of the bolt it replaces, and a shank 11 the same size as the shank of the bolt. The head 10 of the rivet overlaps the outer surface of the slot 5 in the same manner as the head of the bolt, and the shank 11 of the rivet slides in the slot 5 as freely as the shank of the bolt it replaces. The end 12 of the rivet projects through a hole 13 in the jaw 2 and beyond the outer surface of the jaw 2, as shown in Figure 5. The end of the hole 13 adjacent the jaw 1 is cylindrical, as indicated by the numeral 15. The outer part of the hole 13 is tapered as indicated by the reference numeral 16, the angle of taper being a locking taper. When the projecting end 12 of the rivet is headed over the jaw 2 as indicated at 17, the shank 11 is expanded into the tapered section 16 of the hole 13 and is also expanded into tight engagement with the cylindrical section 15 of the hole 13, as shown in Figure 6. This results in the shank 11 of the rivet being non-rotatably united with the jaw 2. The head 17 formed over the jaw 2 is substantially greater than the mass of the tapered portion of rivet shank forced into the tapered section 16 of the hole 13.

During riveting, the head 10 of the rivet is supported by a surface (not shown) which is spaced a small distance (e.g. 0.004" = 0.1 mm approx.) lower than the surface which supports the jaw 1. During riveting, the riveting force clamps the jaw 2 tightly against the jaw 1. The clearance provided by the support for the head 10 of the rivet provides sufficient freedom so that the shank 11 can slide back and forth along the slot 5 when the handles 3 and 4 are rotated to a position in which the tongue 7 and grooves 8 are disengaged. As soon as the tongue 7 reaches the desired position along the slot, the handles 3, 4 are rotated in the jaw closing direction, bringing the tongue 7 into engagement with the selected groove 8.

The strength of the riveted connections is 20% - 30% greater than the strength of the nut and bolt connection it replaces. Because of this increase in strength, the riveted connection never breaks. The strength is greater than the pliers.

CLAIMS

1. Slip joint pliers comprising: first and second members each having a handle connecting to a mating jaw; the jaw of the first member being formed with a slot and with grooves on its inside so that a plurality of pivot positions are defined along its length; the jaw of the second member being formed with a circular hole coaxial with an outwardly facing circular locking taper, and with a

rib extending outwardly from its inside surface and being adapted to be positioned in any selected one of the grooved pivot positions for adjusting the opening between the mating jaws, and a sliding pivot type fastener connecting the mating jaws together, said fastener comprising a rivet having a head and a shank, the head overlapping the slot in the jaw of the first member, and a portion of the shank extending through the slot and being slidable back and forth along the slot, the remaining portion of the shank extending through the circular hole and the circular locking taper and projecting beyond the second member, the end of said remaining portion which projects beyond the second member being formed with a head over the second member and with an expanded tapered portion which fits tightly into the said locking taper and the circular hole so as to form a permanently set non-rotatable joint and sliding pivot fastener.

2. Slip joint pliers as claimed in claim 1 wherein a spaced clearance of predetermined size remains between the original head of the rivet and the side surface of the first member from which the head extends to ensure that the shank of the rivet is freely slidable along said slot.

3. Slip joint pliers as claimed in claim 2, wherein the spaced clearance of predetermined size is .004" (0.1 mm approx).

4. Slip joint pliers as claimed in any preceding claim, wherein the grooves are curved, and the rib and the grooves have similar radii of curvatures so as to interfit in each pivot position in a manner which permits the jaws to pivot freely from a closed to an open position and vice versa.

5. Slip joint pliers as claimed in any preceding claim, wherein the strength of the permanently set non-rotatable joint and sliding pivot fastener exceeds the strength of the pliers.

6. Slip joint pliers as claimed in any preceding claim, wherein the mass of the rivet head formed over the second member is substantially greater than the mass of the tapered portion extending outwardly into the locking taper from the diameter of the circular hole.

7. Slip joint pliers substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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